

Original Article

Testing the Influence of Climatic Conditions upon some Body Traits in Turcana Sheep from Romania

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Abstract

The sheep rearing occupies a traditional place in Romanian animal production. In actual context of promoting sustainable development and need to face the climatic changes, this sector must evolve in an appropriate manner. This study aims to emphasize the characteristics of Turcana breed developmental body traits (full length, withers height, thorax perimeter, body weight, ear length, and tail length), function of the rearing environment, characterized by temperature and rainfall regimen, in North, and East Romania. The climatic data were collected by a 7 years interval, from public reports. We used the program STATISTICA v.8.0 for Windows. The majority of body developmental traits of Turcana sheep (full length -135.20 cm, withers height - 83.03 cm, ear length – 13.12 cm, and tail length – 41.96), recorded biggest values in individuals studied in Suceava County, and smallest (full length -127.95 cm, body weight – 55.75 kg, ear length – 9.35 cm, and tail length – 32.23) in individuals from Brăila County. The biggest body development expressed by analyzed body traits is emphasized in Turcana sheep stocks studied in North Romania, compared to East Romania, except thorax perimeter. Moderate correlations are identified between Turcana sheep full length ($R = 0.480$), and withers height ($R = 0.424$), environmental temperature, and precipitations in studied area.

Keywords: full length, statistics, sheep stocks, withers height.

1. Introduction

According to FAO reports, animal rearing, general speaking, and sheep rearing, in particular became more and more influenced by climate evolution [8, 9].

In last decades, the alterations in climate became a truth that nobody can deny.

These changes have direct influence on livestock rearing systems.

The situation of livestock rearing in our country is not an exception [4, 7]. These premises have particular influence on animal husbandry systems, which have specific particularities in Romania.

After transition years that passed away from political change in our country, the current evolution in animal production have interesting perspectives [8].

On one hand, the sector must focus on sustaining the large farms, and promoting the implementation of the new technologies, and intensification of mechanization, with appropriate governmental support, and on the other hand, by the supplying support to sustainable rearing system and promoting traditional animal husbandry and organic production [1].

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In this context, sheep rearing, which have an almost timeless tradition in Romania, must evolve towards implementation of new rearing technologies, but it must also receive specific attention from governmental entities in order to sustain the traditional breeds, which contribute at large extent to biodiversity conservation [2, 8]. Among traditional Romanian sheep breeds, Turcana is one of the oldest. In Romania, there are known several varieties, which are reared in pure breed all over the country. Even though the breed is not included in official control, or it is at low extent, the evolutions of the breed productions are recorded at local level [3]. Even though Turcana is a robust breed, like all other sheep breeds it is vulnerable to climatic change, and it must record alterations in body trait of productions [2, 5].

In this context, our study aims to emphasize the characteristics of Turcana breed developmental body traits (full length, withers height, thorax perimeter, body weight, ear length, and tail length), function of the rearing environment, characterized by temperature and rainfall regimen, which are different, function of the studied areas, North, and East Romania, respectively.

2. Material and Method

Our trial was developed on Turcana sheep reared in 10 private farms located in 4 counties located in North and East Romania Suceava (4 farms, 16 individuals), Neamț (2 farms, 14 individuals), Brăila (1 farm, 6 individuals), and Constanța (3 farms, 10 individuals), considered separately, and also, by overall (43 individuals), aged between 1 and 6 years.

The following traits were recorded: full length (cm), withers height (cm), thorax perimeter (cm), body weight (kg), ear length, and tail length. Age (years) was also taken into consideration. In order to perform the biometry we applied the methodology emphasized by Dărăban (2016) [2].

The climatic data, according to ANMP reports by each studied county, which are represented by temperature (°C) and rainfall (mm), were collected by a 7 years interval, from public reports [7]. The 7 years interval was considered because it was taken into account the age of the older sheep individuals.

The collected data were processed with STATISTICA v.8.0 for Windows. Descriptive statistics was used in order to calculate the means and standard deviation of several Turcana sheep body traits (full length, withers height, thorax perimeter, body weight, ear length, and tail length), age of sheep individuals, by regions (North, and

East Romania), environmental temperature and rainfall regimen (precipitations). The correlations between above mentioned body traits, environmental temperature and precipitations were calculated using the option "Multiple regression", while option "Graphics" with response areas was used for emphasizing the dependence of body traits considered of importance (full length, withers height, thorax perimeter, and body weight) by temperature, and rainfall regimen.

3. Results and Discussions

In the Suceava County, we studied the body traits of 16 Turcana sheep individuals from 4 private farms. The mean full length by entire stock from Suceava County was of 130.13 cm, while for the other body traits we obtained the following values: withers height - 83.03 cm, thorax perimeter - 82.30 cm, body weight - 58.13 kg, ear length - 13.12 cm, and tail length - 41.96 cm. The mean age of the entire stock is 2.63 years.

The biggest variability of body traits is emphasized in withers height (CV = 17%), while the smallest in tail length (CV = 7.09%). In the Neamț County, we studied the body traits of 14 Turcana sheep individuals from 2 private farms. The means of body traits, by entire stock, have the following values: full length - 135.20 cm, withers height - 65.98 cm, thorax perimeter - 100.43 cm, body weight - 66.25 kg, ear length - 12.88 cm, and tail length - 37.30 cm. The mean age of the entire stock is 5.50 years. The biggest variability of body traits is emphasized in withers height (CV = 27.99%), while the smallest in body weight (CV = 7.23%). In the Brăila County, we studied the body traits of 6 Turcana sheep individuals from 1 private farm. The means of body traits, by entire stock, have the following values: full length - 127.95 cm, withers height - 76.88 cm, thorax perimeter - 101.60 cm, body weight - 55.75 kg, ear length - 9.35 cm, and tail length - 32.73 cm. The mean age of the entire stock is 3 years.

The biggest variability of body traits is emphasized in tail length (CV = 14.86%), while the smallest in withers height (CV = 2.19%). In the Constanța County, we studied the body traits of 10 Turcana sheep individuals from 3 private farms. The means of body traits, by entire stock, have the following values: full length - 131.82 cm, withers height - 77.34 cm, thorax perimeter - 88.34 cm, body weight - 60.83 kg, ear length - 13.04 cm, and tail length - 40.41 cm. The mean age of the entire stock is 3.58 years. The biggest variability of body traits is emphasized in body weight (CV = 20%), while the smallest in full length (CV = 5.44%). The

values of the coefficient of variability, under 30%, for all studied body traits, and individuals' age, show that all means are representative for the entire population, we analyzed within this trial (Table 1).

By Turcana sheep stocks from North Romania (Suceava and Neamț Counties), the following means of body traits are reported: full

length – 135.20 cm, withers height – 65.98 cm, thorax perimeter – 100.43 cm, body weight – 66.25 kg, ear length – 12.88 cm, and tail length – 37.30 cm. The mean age of the entire stock is 5.50 years. The biggest variability of body traits is emphasized in withers height (CV = 26.44%), while the smallest in ear length, CV = 10.04%, respectively (Table 2).

Table 1. The basic statistics for the body traits quantified in Turcana sheep reared in North-Eastern and Eastern Romania, and significance of differences considered against the means by entire experimental stock

Trait	N	\bar{X}	Min.	Max.	s	CV%
Suceava County						
Full length, cm	16	130.13	110.50	154.50	16.52	12.70
Withers height, cm	16	83.03	63.30	102.40	14.11	17.00
Thorax perimeter, cm	16	82.30	66.50	120.40	18.08	21.96
Body weight, kg	16	58.13	40.00	80.00	13.87	23.86
Ear length, cm	16	13.12	10.80	14.90	1.37	10.41
Tail length, cm	16	41.96	38.20	46.30	2.98	7.09
Age, years	16	2.63	1.00	3.00	0.46	17.49
Neamț County						
Full length, cm	14	135.20	131.00	138.30	3.37	2.49
Withers height, cm	14	65.98	23.30	81.20	28.47	43.15
Thorax perimeter, cm	14	100.43	85.70	113.50	11.39	11.34
Body weight, kg	14	66.25	60.00	70.00	4.79	7.23
Ear length, cm	14	12.88	10.90	13.90	1.37	10.66
Tail length, cm	14	37.30	31.20	42.60	6.05	16.22
Age, years	14	5.50	3.00	7.00	1.48	26.90
Brăila County						
Full length, cm	6	127.95	120.00	135.40	6.46	5.05
Withers height, cm	6	76.88	75.00	78.70	1.68	2.19
Thorax perimeter, cm	6	101.60	98.80	106.60	3.64	3.58
Body weight, kg	6	55.75	51.00	60.00	3.77	6.77
Ear length, cm	6	9.35	9.10	9.70	0.26	2.83
Tail length, cm	6	32.73	29.00	39.50	4.86	14.86
Age, years	6	3.00	2.00	4.00	0.82	27.22
Constanța County						
Full length, cm	10	132.94	119.40	144.00	7.23	5.44
Withers height, cm	10	75.62	68.60	83.80	5.18	6.85
Thorax perimeter, cm	10	94.60	87.90	109.80	8.04	8.50
Body weight, kg	10	57.00	40.00	70.00	11.60	20.34
Ear length, cm	10	12.14	11.00	13.80	1.05	8.64
Tail length, cm	10	39.28	31.00	44.40	4.76	12.12
Age, years	10	2.85	1.50	3.50	0.74	25.96

Table 2. The basic statistics for the body traits quantified in Turcana sheep reared in North Romania

Trait	N	\bar{X}	Min.	Max.	s	CV%
Full length, cm	30	131.82	110.50	154.50	13.53	10.26
Withers height, cm	30	77.34	23.30	102.40	20.45	26.44
Thorax perimeter, cm	30	88.34	66.50	120.40	17.97	20.34
Body weight, kg	30	60.83	40.00	80.00	12.03	19.77
Ear length, cm	30	13.04	10.80	14.90	1.31	10.04
Tail length, cm	30	40.41	31.20	46.30	4.57	11.31
Age, years	30	3.58	1.50	6.00	0.98	27.37

Concerning Turcana sheep stocks from East Romania (Brăila and Constanța Counties), the following means of body traits are reported: full length – 131.51 cm, withers height – 75.98 cm, thorax perimeter – 96.60 cm, body weight – 56.64

kg, ear length – 11.34 cm, and tail length – 37.41 cm. The mean age of the entire stock is 2.89 years. The biggest variability of body traits is emphasized in body weight (CV = 17.36%), while the smallest in full length, CV = 5.45%, respectively (Table

3). These values (Table 2 and Table 3) are much bigger compared to those specified as Turcana breed characteristics in official FAO reports [7].

By entire experimental period of 7 years (2010 – 2016), the mean temperature recorded in the Suceava County is 7.68 °C, with a minimum year temperature of 7.30 °C, and a maximum of 8.25 °C. In the same area, for the mean precipitations, calculated by the same period is reported an amount

of 656 mm, with an annual minimum of 590 mm, and a maximum of 690 mm. In the same period, the mean temperature recorded in the Neamț County is 8.30 °C, with a minimum year temperature of 7.90 °C, and a maximum of 9.10 °C. In the same area, the mean precipitations, calculated by the same period reached an annual amount of 656 mm, with an annual minimum of 590 mm, and a maximum of 690 mm.

Table 3. The basic statistics for the body traits quantified in Turcana sheep reared in East Romania

Trait	N	\bar{X}	Min.	Max.	s	CV%
Full length, cm	16	131.51	119.40	144.00	7.16	5.45
Withers height, cm	16	75.98	68.60	83.80	4.42	5.82
Thorax perimeter, cm	16	96.60	87.90	109.80	7.65	7.92
Body weight, kg	16	56.64	40.00	70.00	9.83	17.36
Ear length, cm	16	11.34	9.10	13.80	1.58	13.91
Tail length, cm	16	37.41	29.00	44.40	5.53	14.79
Age, years	16	2.89	1.50	4.00	0.78	26.99

In Brăila County, for the studied period, the mean temperature is 10.99 °C, with a minimum year temperature of 10.50 °C, and a maximum of 11.25 °C. In the same area, the mean precipitations, calculated by the same period reached an annual amount of 412 mm, with an annual minimum of 320 mm, and a maximum of 490 mm.

In Brăila County is 8.30 °C, for the studied

period, 2010 – 2016, respectively, the mean of the annual temperatures is of 10.76 °C, with a minimum year temperature of 9.80 °C, and a maximum of 11.20 °C.

In the same area, the mean precipitations, calculated by the same period, reached an annual amount of 457 mm, with an annual minimum of 400 mm, and a maximum of 520 mm (Table 4).

Table 4. The basic statistics for the climatic factors temperature (°C) and precipitations (mm) in experimental area by 2010-2015

Trait	N	\bar{X}	Min.	Max.	s
Suceava County					
Temperature, °C	2555	7.68	7.30	8.25	0.22
Precipitations, mm	2555	656.00	590.00	690.00	34.46
Neamț County					
Temperature, °C	2555	8.30	7.90	9.10	0.44
Precipitations, mm	2555	613.00	500.00	680.00	51.39
Brăila County					
Temperature, °C	2555	10.99	10.50	11.25	0.27
Precipitations, mm	2555	412.00	320.00	490.00	79.00
Constanța County					
Temperature, °C	2555	10.76	9.80	11.20	0.55
Precipitations, mm	2555	457.00	400.00	520.00	38.80

Testing the intensity of influence of environmental temperatures and possible way in which climatic parameters may influence the development of the body full length, and withers height of 46 Turcana sheep individuals analyzed, by entire experimental areal corresponding to 4 counties (Suceava, Neamț Brăila and Constanța Counties) including 10 farms, emphasizes weak to very weak interactions (Figs. 1 – 2).

Moderate multiple correlation is identified between full length of Turcana sheep and analyzed climatic parameters ($R = 0.480$), representative for 23% of analyzed stocks.

Full lengths over 150 cm are stimulated by mean annual temperature with values between 8.1 – 8.5°C, and mean annual of precipitations by day, between 11 – 11.3 mm (Fig.1).

Moderate multiple correlation is also identified between withers heights of Turcana sheep and analyzed climatic parameters ($R = 0.424$), representative for 18% of analyzed stocks.

Withers heights over 79 cm are stimulated by mean annual temperature with values between 8.1 – 8.6°C, and mean annual of precipitations by day, between 11 – 11.2 mm, expressed by entire experimental period (Fig.2).

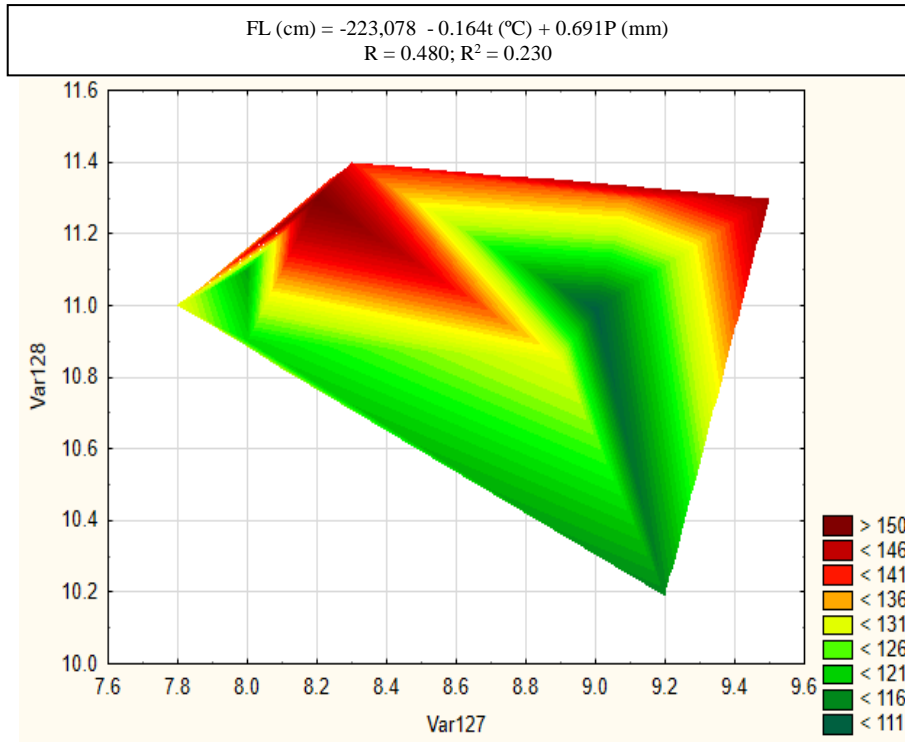


Figure 1. The multiple correlation calculated for Turcana sheep full length (FL) and climatic parameters, temperature (t, °C) and precipitations (P, mm), recorded by entire experimental areal

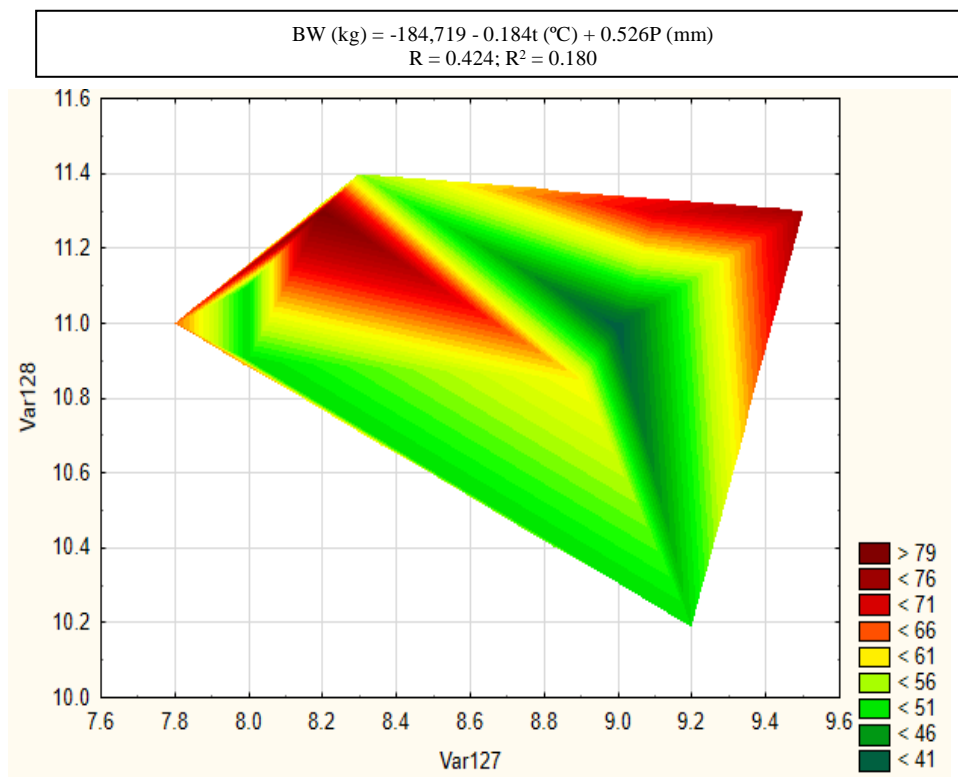


Figure 2. The multiple correlation calculated for Turcana sheep withers height (WH) and climatic parameters, temperature (t, °C) and precipitations (P, mm), recorded by entire experimental areal

The increase of temperature influences at low extent, and precipitation at higher extent, the evolution of full length, and withers heights of studied Turcana sheep, by entire experimental areal, but in contradictory sense. Temperature increase have negative influence on both full length and withers height increase, while precipitations, have positive influence (Fig. 1, and Fig. 2).

4. Conclusions

The highest mean values for body traits analyzed by entire experimental areal are identified as follows: full length -135.20 cm, withers height - 83.03 cm, ear length - 13.12 cm, and tail length - 41.96, in Turcana sheep from Suceava County, body weight - 66.25 kg, in Turcana stocks studied in Neamț County, thorax perimeter - 101.60 cm in Turcana sheep studied in Brăila County, while the smallest mean values for body traits analyzed by entire experimental areal are identified as follows: full length -127.95 cm, body weight - 55.75 kg, ear length - 9.35 cm, and tail length - 32.23, in Turcana sheep from Brăila County, withers height - 65.98 cm in Neamț County, and body weight - 66.25 kg, in Turcana stocks studied in Neamț County, and thorax perimeter - 101.60 cm in Turcana sheep studied in Suceava County.

The biggest body development expressed by analyzed body traits is emphasized in Turcana sheep stocks studied in North Romania, compared to East Romania, except thorax perimeter.

Moderate correlations are identified between Turcana sheep full length ($R = 0.480$), and withers height ($R = 0.424$), and climatic parameters represented by mean temperature and mean daily precipitation supply expressed by entire experimental period, representative for 18%, and 23%, respectively of the studied stocks.

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